

Abstract

The invention relates to a process and an apparatus for producing hydrogen-containing fuel gases for fuel cells by catalytic reforming of hydrocarbons and subsequent gas purification. The process is characterized in that the catalytic reforming comprises two successive stages of which the first stage comprises autothermal reforming and the second stage comprises low-temperature steam reforming at temperatures below 650°C.

In the first stage (autothermal reforming, ATR stage), a feed mixture of hydrocarbons, oxygen and water or water vapour is reacted over a catalyst in an autothermal reforming reaction to convert it incompletely into a hydrogen-rich gas mixture. The mixture which still contains residual amounts of hydrocarbons is then reacted in a subsequent steam reforming stage (second stage, SR stage) to give a hydrogen-rich fuel gas. A fuel gas which has a temperature at the reactor outlet of 400-650°C and contains a very high proportion of hydrogen is obtained. Owing to the low outlet temperatures, the fuel gas can be passed directly to a gas purification stage without use of additional heat exchangers.

In addition to the improvement in the reformer efficiency, a more compact and cheaper reformer design is made possible by the invention. Process and apparatus are used for producing hydrogen or hydrogen-containing fuel gases for fuel cells, in particular for mobile and stationary applications.